What is Claimed:

1. An interference spectrometer comprising:

an interference microscope having an object path and a reference path and further including an objective lens with a corresponding back focal plane;

a source for providing Koehler illumination to the back focal plane of the interference microscope objective lens; and

a detector positioned to record an optical image of the back plane of the objective lens.

2. An interference spectrometer as in claim 1 adapted to illuminate an object at multiple angles.

3. An interference spectrometer as in claim 1 adapted to illuminate an object at multiple angles simultaneously.

4. An interference spectrometer as in claim 1 adapted to illuminate an object at multiple wavelengths.

5. An interference spectrometer as in claim 1 adapted to illuminate an object at multiple wavelengths simultaneously.

6. An interference spectrometer as in claim 1 adapted to illuminate an object at multiple wavelengths and multiple angles.

7. An interference spectrometer as in claim 1 adapted to illuminate an object simultaneously at multiple wavelengths and multiple angles.

8. An interference spectrometer as in claim 1 further comprising apparatus for mechanically varying the path-length difference between the object path and the reference path in the interference microscope.

9. An interference spectrometer as in claim 8 wherein the detector digitizes and records a sequence of optical images of the back focal plane of the objective lens as the path-length difference between the object path and the reference path in the interference microscope is varied.

10. An interference spectrometer as in claim 9 wherein the detector separates the digitized optical images into multiple channels, wherein each channel corresponds to a single location on the back focal plane of the objective lens.

11. An interference spectrometer as in claim 10 further including a processor for performing Fourier transform analysis on multiple channels to determine specular reflection coefficients.

12. An interference spectrometer as in claim 11 wherein the processor performs Fourier transform analysis on multiple channels to determine specular reflection coefficients for multiple angles of illumination.

13. An interference spectrometer as in claim 12 wherein an object is placed at the object plane and the object includes a diffraction grating.

14. An interference spectrometer as in claim 12 further comprising an inverse signature comparator for comparing the specular reflection coefficients to a number of signatures corresponding to known object parameters.

15. An interference spectrometer as in claim 14 wherein the interference microscope is of the Mireau type.

16. An interference spectrometer as in claim 14 wherein the interference microscope is of the Linnik type.

17. An interference spectrometer as in claim 14 wherein a polarizing filter is placed in the illumination channel.

18. An interference spectrometer as in claim 14 wherein a polarizing filter is placed between the back focal plane and the detector.

19. An interference spectrometer as in claim 7 wherein the source is a source of broadband illumination.

20. An interference spectrometer as in claim 7 wherein the source is a source of quasi-monochromatic illumination.

21. A method of performing interference spectroscopy comprising the steps of:

providing an interference microscope having an object path and a reference path and further having an objective lens with a corresponding back focal plan;

providing Koehler illumination to the back plane of the interference microscope objective lens; and

detecting an image of the back focal plane of the objective lens.

22. A method as in claim 21 including the further step of mechanically varying the path-length difference between the object path and the reference path in the interference microscope.

23. A method as in claim 21 wherein the step of detecting further includes recording a sequence of optical images of the back plane of the objective lens as the path-length difference between the object path and the reference path in the interference microscope is varied.

24. A method as in claim 23 including the further step of separating the sequence of recorded optical images into multiple channels, wherein each channel corresponds to a single location on the back focal plane of the objective lens.

25. A method as in claim 24 including the further step of performing Fourier transform analysis on multiple channels to determine specular reflection coefficients.

26. A method as in claim 25 wherein the step of performing Fourier transform analysis further includes performing Fourier transform analysis on multiple channels to determine specular reflection coefficients for multiple angles of illumination.

27. A method as in claim 26 further including the step of placing an object at the object plane wherein the object includes a diffraction grating.

28. A method as in claim 26 further including the step of performing inverse signature comparison between the specular reflection coefficients and signatures corresponding to known object parameters.

29. A method as in claim 28 wherein the step of providing an interference microscope includes providing an interference microscope of the Mireau type.

30. A method as in claim 28 wherein the step of providing an interference microscope includes providing an interference microscope of the Linnik type.

31. A method as in claim 28 further including the step of providing a polarizing filter in the illumination channel.

32. A method as in claim 28 further including the step of providing a polarizing filter between the back focal plane and the detector.

33. An interference spectrometer as in claim 21 wherein the step of providing Koehler illumination provides broadband illumination.

34. An interference spectrometer as in claim 21 wherein the step of providing Koehler illumination provides quasi-monochromatic illumination.